

Retention of Cardiopulmonary Resuscitation Skills in Nigerian Secondary School Students

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ABSTRACT

Background / Objective: For effective bystander cardiopulmonary resuscitation (CPR), retention of CPR skills after the training is central. The objective of this study was to find out how much of the CPR skills a group of Nigerian secondary school students would retain six weeks after their first exposure to the conventional CPR training.

Materials and Methods: It was a quasi-experimental study design with participants drawn from both private and public secondary schools in Obio / Akpor Local Government Area in Port Harcourt, Rivers State, Nigeria. The initial cohort (stage I) involved 400 participants from senior secondary school 1 and 2 (SS1) and SS2) when their baseline CPR skills were assessed. The same group was assessed again immediately after the CPR training (stage II) and six weeks post training (stage III). The final cohort involved in both stages I, II and III of the study was 322 exposed to both class room teachings and the practical hands-on sessions using manikins in line with the American Heart Association (AHA) guidelines. The data was analyzed using descriptive statistics, ANOVA and t-test.

Results: The CPR skills retained by the participants six weeks after their exposure to the training were found statistically ($P < 0.05$) significant. Neither age nor gender had any significant influence on their CPR skills.

Conclusions: The Nigerian secondary school students can learn and retain CPR skills and could serve as effective bystanders CPR providers in emergency situations. Incorporation of the teaching of CPR into Nigerian secondary school curricula is recommended.

Keywords: Cardiopulmonary Resuscitation (CPR) Skills Retention, Secondary School Students, Nigeria

INTRODUCTION

For any effective bystander cardiopulmonary resuscitation (CPR) service, retention of acquired CPR skills remains very central. Out-of-hospital cardiac arrest (OHCA) remains on the increase in many parts of the globe (Rea, Eisenberg, Becker, Murray & Hearne, 2003; AHA, 2010; Lloyd-Jones, Adams, Carnethon, De Simone, Ferguson, Flegal, Hong, 2009; ERC, 2010). The teaching of cardiopulmonary resuscitation (CPR) skills among secondary school students is internationally encouraged (Rea et al., 2003). Norway became the first country to teach CPR to schoolchildren, followed six years later by Czechoslovakia (Reder & Quan, 2003). Since then, CPR training has been offered sporadically to students in Scandinavia, Great Britain, Canada, the United States and other countries Uray, Lunzer, Ochschofer, Thanikkel, Zingerle, Brandl, Sterz, 2003).

Cardiopulmonary resuscitation (CPR) skills are taught as an optional component of the New Zealand school curriculum, in both primary and secondary schools. The American Academy of Paediatrics (1993) has opined that schools play an important role in providing students with basic emergency lifesaving skills as part of the school health education programme. It has been reported that training of school children will make it possible to train 20% of any population in CPR as the minimum standard recommended by the American Heart Association (Connolly, Toner, Connolly, McCluskey, 2007).

Also, the International Liaison Committee on Resuscitation in 2010 strongly recommended that instruction in CPR be incorporated as a standard part of the school curriculum. It is believed that this will act as part of their preparation for response to medical emergencies both in the school and at home. It is believed that on a long term basis, children trained in CPR will contribute significantly to the number of adult trained in any community. It is expected that this will have a direct benefit of increasing the number of people trained to perform CPR thereby increasing the likelihood that a victim of out-of-hospital cardiac arrest (OHCA) will promptly receive

CPR. In addition, students are likely to train family members and share materials used in school-based programme at home which can further increase the programme's yield in terms of the total number of members of the community trained per unit of class time expended (Lotfi, White, Rea, Cobb, Copass, Yin, ... Eisenberg, 2007; Lorem, Palm, Wik, 2008). Accordingly, many countries have initiated CPR programmes for school children or have conducted research works to support the justification of CPR in schools (Kang, Yang, Lee, Youn, Yim, et al., 2006; Hamasu, Morimoto, Kuramoto, Horiguchi, Iwami, et al., 2009; Lund-Kordahl, Olasveengen, Lorem, Samdal, Wik et al., 2010; Naqvi, Siddiqi, Hussain, Batool, Arshad, 2011; Taniguchi, Sato, Fujita, Okajima, Takamura, 2012; Lee, Lee, Shin, Ryoo, Kim, Park et al., 2012).

In an attempt to contribute in CPR training in Nigerian schools, this study aimed at assessing the CPR skills retention of a group of Nigerian secondary school students six months after their initial exposure to CPR skills acquisition. It was hypothesized as follows: (1) that the level of CPR skills retention of the Nigerian students would not be statistically significant six months following their initial exposure to the conventional CPR skills training, (2) that age of the participants would not significantly influence the CPR skills retention of the participants, (3) that gender would not significantly influence the CPR skills retention of the participants, and (4) that class of the participants (SS1 and SS2) would not have any significant influence on the CPR skills retention of the participants.

MATERIALS AND METHODS

Research Design

This study adopted the quasi-experimental design.

Population of the Study

The population for the study was drawn from all the 76 private and 17 public senior secondary schools in Obio / Akpor Local Government Area of Rivers State. The students in SS1 and SS2 were the respondents to the questionnaires. There were altogether 6400 SS1 and SS2 students in the Obio / Akpor Local Government - while 4000 were from public schools, 2400 were from private schools. These figures were given by the Director of Schools Board at the Obio / Akpor Local Government Secretariat, Port Harcourt, Nigeria.

Sample and Sampling Techniques

Four hundred (400) SS1 and SS2 students were drawn from the public and private schools in Obio / Akpor Local Government Area of Rivers State. Two public and two private schools were purposively selected and one hundred students selected in each school to get the initial study cohort (fifty from SS1 and fifty from SS2). Due to some attrition during the study, the final study six weeks after the training dropped to the three hundred and twenty two (322) participants who were involved from pre-training, immediately after training and six weeks post-training CPR skills assessments.

Instrumentation

The modified CPR lecture on power points, CPR skills steps on power points, manikin for skills practice and skills evaluation guide were used. The power point was used to deliver CPR lecture and CPR skills steps. It helped to impact CPR knowledge on the participants and they were able to watch demonstration of skills on the screen. The manikin was used to demonstrate, train and evaluate CPR skills acquired by the participants. The skills evaluation guide was used to evaluate the level of the hands-on skills acquired.

Method of Data Collection

The researcher met and obtained consent from the Principals of the selected secondary schools, all the schools were visited on their appointment days for the training and data collection. The participants were informed about the nature and purpose of the study on the training day. The data was collected as follows: **Stage 1 (Pre-training assessment, i.e. before training on CPR skills)** when each of them was shown a manikin and was asked to carry out CPR on it with the assumption that it was a 'person that just collapsed suddenly,' **Stage 2 (Training and Immediate Post –training assessment):** Teaching, practical demonstrations and hands-on trainings were

carried out for 135 minutes using power points, modified AHA “Be The Beat” Video clips, Rap songs on CPR and manikin followed by 100 minutes of group practical hands-on sessions using group participatory approach on the manikins. In line with American Heart Association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care (2010), the skills evaluation guide form was used to score their skills performance by the researcher who is an AHA Certified CPR Instructor. **Stage 3(six weeks Post training on CPR Skills re-assessment):** The same participants were re-assessed on CPR skills as they were exposure again to manikins and were asked to perform CPR on the manikins with the assumption that the manikins were victims of sudden cardiac arrest. The same researcher scored them individually as they were performing the procedure.

Data Analysis

In addition to descriptive statistics, the data collated on the pre- training, immediately after training and six weeks post-training skills of the participants were analyzed using ANOVA and t-test to test the null hypothesis at $P < 0.05$ level of significance.

RESULTS

Table I shows the CPR skills retention of the 322 participants with mean CPR skills loss of only 0.97. Table 2 provides the paired t- test analysis of the differences in the level of CPR skills of the participants six weeks after the CPR training with rejection of the first null hypothesis meaning that statistically significant level of CPR skills was retained by the participants ($P < 0.05$).

Table 3 shows the influence of age on CPR skills retention by the participants with the null hypothesis accepted as age did not influence the retention of CPR skills by the participants ($P > 0.05$). The null hypothesis on the influence of gender on CPR skills retention by the participants was tested in Table 4. The null hypothesis was accepted ($P > 0.05$). Table 5 shows the testing of the null hypothesis involving the influence of school class (SS1 and SS2) on CPR skills retention by the participants. The null hypothesis was also accepted ($P > 0.05$).

Figure 1 shows the graphical presentation of the CPR skills acquisition and retention pattern by the participants

Table 1: Level of CPR Skills six weeks after training (Retention)

Variables	N	Post-Test \bar{x}	Retention \bar{x}	\bar{x} Loss	% Loss
CPR Skills	322	7.92 \pm .98	6.95 \pm 1.71	.97	12.24 %

Table 2: Paired t-test analysis of the difference in the level of CPR Skills

Paired Sample	N	\bar{x}	SD	DF	t-cal	t-crit	P-value (2-tailed)	Decision
CPR Skills	322	.96	1.88	321	9.17	1.96	.000	Rejected

Significant at $p < 0.05$

Table 3: Influence of Age of the participants on CPR Skills (Pre, Post and Retention)

Items	N	Sources of Variation	Sum of Square	Mean Square	DF	F-Cal	F-crit	P-value	Decision
CPR Skills	966	Between Group	29.445	9.815	3				Accepted
		Within Group	10287.697	10.694	962	2.09	2.61	.148	
		Group Total	10317.143		965				

Significant at $p > 0.05$

Table 4: Influence of Gender on the participants CPR Skills (Pre, Post and Retention)

Items	N	Sources of Variation	Sum of Square	Mean Square	DF	F-Cal	F-crit	p-value	Remark
CPR Skills	966	Between Group	2.360	2.360	1				Accepted
		Within Group	10314.783	10.700	964	.288	3.85	.192	
		Group Total	10317.143		965				

Significant at $p > 0.05$

Table 5: Influence of School Class on CPR Skills (Pre, Post and Retention)

Items	N	Sources of Variation	Sum of Square	Mean Square	DF	F-Cal	F-crit	P-value	Remark
CPR Skills	966	Between Group	3.952	3.952	1				Accepted
		Within Group	10313.190	10.698	964	.29	6.67	.188	
		Group Total	10317.143		965				

Significant at $P > 0.05$

Estimated Marginal Means of Skill

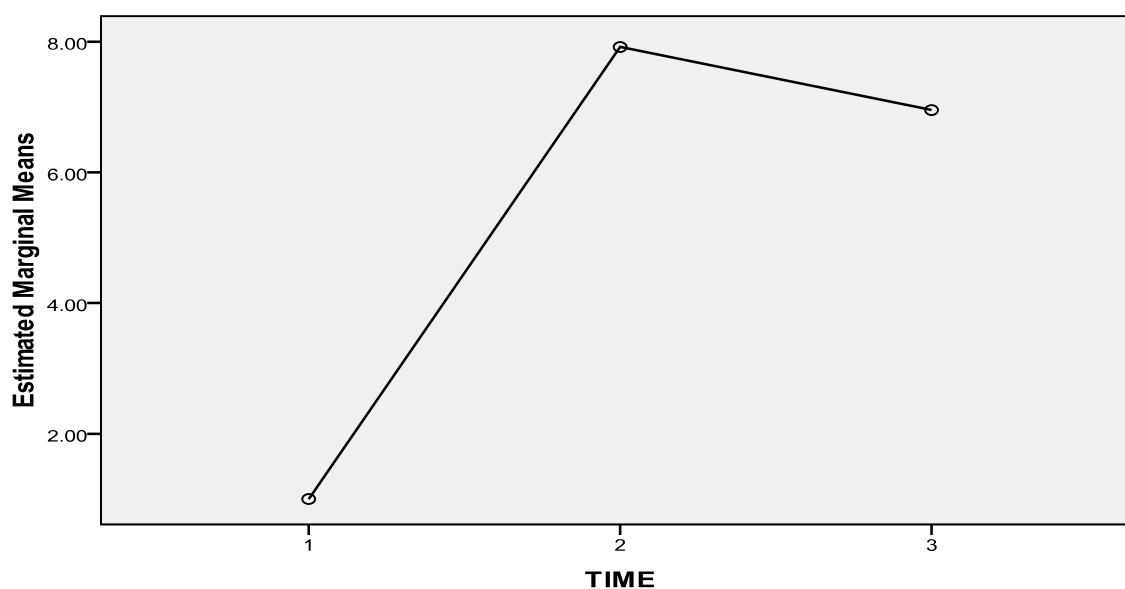


Figure 1: Graphical Presentation of the CPR Skills Acquisition and Retention Pattern by the Participants

DISCUSSION

Chest compressions and rescue breathing are psychomotor skills that are best learned through practice. The level of proficiency in performing CPR skills gained from training is directly related to the amount of time provided for skills practice during training.¹⁷ Studies that have assessed CPR skills among trainees in programmes that do

not offer psychomotor skills practice sessions (“cognitive-only” CPR training) have consistently shown that trainees do not, on average, achieve an acceptable standard level of proficiency.^{17,18} These authors believe that to optimize skills performance, psychomotor skills practice is an essential component of CPR training programmes.

Similarly, in an attempt to address the question of how much the length of a cardiopulmonary resuscitation training programme can be reduced without ruining its effectiveness, a study by Nishiyama et al¹⁹ compared compression-only CPR and the conventional CPR. They found that the shortened compression-only CPR training programme appeared to help the general public retain CPR skills better than the conventional CPR training programme. Our study being the first of such training programme among Nigerian secondary school students, involved the conventional CPR training programme for a baseline data that could serve as a springboard for further related research activities in Nigeria.

In this Nigerian study, the selected students were found to have no skills exposure whatsoever concerning CPR before the training but after the training they performed reasonably well in the ‘hands-on skills,’ which is in agreement with the similar work of Meissner et al.²⁰ In that study, before the training, 29.5% of students performed chest compressions as compared to 99.2% post-training ($P < 0.05$). So, it was concluded that training in high school is highly effective considering the minimal amount of previous knowledge the students possessed. Similarly, it can be concluded that in the present Nigeria study that the training was highly effective as their performance was positively impacted where the pre-training CPR skills was virtually zero and post-training gain in CPR skills of 92.0% ($P < 0.05$).

In a similar prospective cohort study involving Danish high school students, the improvement in the participants’ self-assessed BLS skills to carry out emergency CPR as a bystander improved from about 33% to 90% after 45 minutes of CPR training.²¹ Although self-assessed, this improvement is comparable to the present Nigerian study except that their baseline self-assessed CPR skills was higher than that observed in our present study. This difference in baseline CPR skills between the students in Denmark and Nigerian can be explained by the fact that the Danish students had received CPR training previously while their Nigerian counterparts had never had such exposure before this present study. In Pakistan, it has been shown that children can learn and perform basic life support skills with reasonable accuracy and can retain these skills for longer periods after CPR training and the training has been recommended for children after 6th grade in the country.¹³

In a longitudinal study by Miro et al²² involving a 5-year experience of providing training in basic cardiopulmonary resuscitation (CPR) for students in Spanish obligatory secondary school education; the trainers applied the CPR programme developed for secondary schools. At the end of that study about 58% of learning was achieved immediately after the PROCES, following a multivariate analysis. In fact, a systemic review by Plant and Taylor²³ on how best to teach CPR in school children have shown that CPR training delivered in various ways is successful in a wide age range of children. In Oslo (Norway), Utstein data from out-of-hospital cardiac arrests (OHCAs) showed that survival after OHCAs was increased after improving weak links in their local Chain of Survival, quality of advanced life support (ALS) and post-resuscitation care.

Concerning the participants’ willingness to give chest compressions (CC) with mouth-to-mouth ventilation (MMV) to strangers, this Nigerian study recorded that 66.3% were willing and 89.6% were ready to same to trauma victims while a report from Japan¹⁴ reported 15-30% despite the fact that many of the participants had received CPR training previously. However, both the Japanese study¹⁴ and this Nigerian study have a common finding of having higher percentage of participants willing to give CPR to their relatives.

CONCLUSIONS

- The present Nigerian school-based study has shown that the students were able to significantly improve their CPR skills comparable to their counterparts in the developed parts of the world where CPR training have been incorporated in their schools curricula or where studies on CPR training had been carried out.
- The participants showed much interest and enthusiasm in the CPR training programme which have reflected in the marked CPR skills gain from the study and the high percentage of them desiring to have

the programme formally thought in Nigerian secondary schools, as well as those willing to carry out the conventional CPR on OHCA cases including strangers and trauma victims.

RECOMMENDATIONS

1. There is need for more similar CPR skills training studies to be carried out in more secondary schools in other parts of Nigeria
2. The incorporation of CPR skills training programmes into Nigeria school system should be given serious attention by the Federal Ministry of Education, in line with the global trend in preparation for better management of the expected increase in out-of-hospital cardiac arrest (OHCA) cases due to growing modernization.

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APPENDIX: Some of the Pictures taken during the study (Figures I, II and III)



Figure 1: A CPR teaching session before the Hands-on session



Figure 2: A CPR Hands-on session during the training in a Nigerian secondary school



Figure 3: A CPR Hands-on session during the training in another Nigerian secondary school